

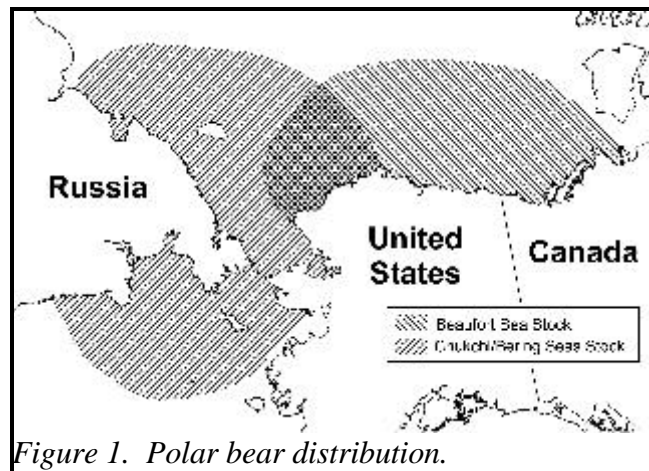
## **POLAR BEAR (*Ursus maritimus*): Alaska**

### **Southern Beaufort Sea Stock**

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#### **STOCK DEFINITION AND GEOGRAPHIC RANGE**

Polar bears are circumpolar in their distribution in the northern hemisphere. They occur in several largely discrete stocks or populations (Harington 1968). Polar bear movements are extensive and individual activity areas are enormous (Garner *et al.* 1990, Amstrup 1995). The parameters used by Dizon *et al.* (1992) to classify stocks based on the phylogeographic approach were considered in the determination of stock separation in Alaska. Several polar bear stocks are known to be shared between countries (Amstrup *et al.* 1986, Amstrup and Demaster 1988). Lentfer hypothesized that two Alaska stocks exist based upon: (a) variations in levels of heavy metal contaminants of organ tissues (Lentfer 1976, Lentfer and Galster 1987); (b) morphological characteristics (Manning 1971; Lentfer 1974; Wilson 1976); (c) physical oceanographic features which segregate stocks (Lentfer 1974) and; (d) movement information collected from mark and recapture studies of adult female bears (Lentfer, 1983, Amstrup 1995) (Figure 1).



Recent studies (Amstrup 1995) have shown that the eastern bound of the Southern Beaufort Sea stock occurs south of Banks Island and east of the Bailie Islands, Canada. The western bound is near Point Hope. The southern boundary of the northern Beaufort Sea stock was delineated by Bethke *et al.* (1996). There is minimal overlap between the southern and northern Beaufort Sea populations (Amstrup and Durner In prep). An area of overlap between the Southern Beaufort Sea stock and the Chukchi/Bering seas stock occurs between Point Barrow and Point Hope, centered near Point Lay (Garner *et al.* 1990, Garner *et al.* 1994, Amstrup 1995). Telemetry data further indicate that adult female polar bears marked in the Southern Beaufort Sea spend about 25% of their time in the northeastern Chukchi Sea, whereas females captured in the Chukchi Sea spend only 6% of their time in the Southern Beaufort Sea (Amstrup 1995). Activity areas of Southern Beaufort Sea females averaged 162,124 km<sup>2</sup> (range 12,730 to 596,800 km<sup>2</sup>) (Amstrup 1995). Current analysis of mitochondrial DNA indicate little differentiation of the Alaska polar bear stocks (Cronin *et al.* 1991, Scribner *et al.* 1977). However, the use of microsatellites to differentiate polar bear populations in the Canadian Arctic (Paetkau *et al.* 1995) may prove to be a useful technique resolving future questions concerning stock separation and management units in Alaska.

Past management regimes have consistently distinguished between the Alaskan stocks based upon the previous information. The Inuvialuit of the Inuvialuit Game Council (IGC), Northwest Territories, and the Inupiat of the North Slope Borough (NSB), Alaska, signed a Polar Bear Management Agreement for the Southern Beaufort Sea in January 1988. This agreement, which is similar in many respects to the international Agreement on the Conservation of Polar Bears signed by the five circumpolar nations of the Arctic, sets harvest guidelines based on the principles of sustained yield.

#### **POPULATION SIZE**

Polar bears occur at low densities throughout their circumpolar range (DeMaster and Stirling 1981). They are long lived, mature late, have an extended breeding interval, and have small litters (Lentfer *et al.* 1980, DeMaster and Stirling 1981). Accurate population estimates for the Alaskan populations have been difficult to obtain because of low population densities, inaccessibility of the habitat, movement of bears across international boundaries, and budget limitations (Amstrup and DeMaster 1988, Garner *et al.* 1992).

#### **Minimum Population Estimate**

Amstrup et al. (1986) and Amstrup (1995) are the sources of populations estimates which include variance estimates. Amstrup et al. (1986) estimated the Southern Beaufort Sea stock at 1,778 (S.D.  $\pm$  803; C.V. = 0.45) during the 1972-83 period. Amstrup (1995) estimated the Southern Beaufort Sea stock at around 1800 animals. Recent modeling and analysis of an expanded population data base, derived from capturing, marking and recapturing animals, provides potential estimates of abundance for this stock. Population size was estimated through a modified Lincoln-Petersen model incorporating independent measures of survival (Amstrup 1995). Estimates were developed for the entire population and also for the female component. The female population estimates were developed since capture bias excluding males occurred during some years. The modified Lincoln-Peterson estimate is corrected, based on radio telemetry, for animals unavailable for sampling. The population size estimate, judged most accurate for the early years of the mark and recapture study was obtained in 1976 (N=835, C.V.= 0.29). This was the lowest C.V. value for any of the early years of the study. The population size estimate for the later years judged most accurate was obtained in 1986 (N=1,417, C.V.=0.10). Growth rates based on changes in the female population during the same period, using the same data, changed from 598 (C.V.=0.45) to 744 (C.V.=0.13). This change suggested an instantaneous growth rate of 0.022. A Leslie matrix estimate of population growth of females based upon satellite telemetry data was 0.024 and collaborated the Lincoln-Petersen estimate. The 0.022 growth rate was selected and applied to the 1986 population estimate (1,417) to derive a 1996 population size projection.

The resultant population point estimate is 1,765. Thus the  $N_{MIN}$  value calculated here "provides reasonable assurance that the stock size is equal to or greater than the estimate" (following the 1994 reauthorization of the Marine Mammal Protection Act. For a population size of 1,765 and a corresponding C.V. of 0.10, the  $N_{MIN}$  is 1,611.

### **Current Population Trend**

Prior to the 20th century, when Alaska's polar bears were hunted primarily by Natives, both stocks probably existed near carrying capacity (K). Once harvest by non-Natives became common in the Southern Beaufort Sea, the size of these stocks declined substantially (Amstrup 1995). Since passage of the Marine Mammal Protection Act (MMPA) in 1972, both stocks seem to have increased based on: (a) mark and recapture data; (b) observations by Natives and residents of coastal Alaska and Russia; (c) catch per unit effort indices; (d) reports from Russian scientists (Uspenski and Belikov 1991); and (e) harvest statistics on the age structure of the population. Recapture data on survival and recruitment for females from the Southern Beaufort Sea stock indicate a population growth rate of 2.4% from 1981 to 1992 (Amstrup 1995). Comparisons of Southern Beaufort Sea data from 1967-74 and 1981-92 periods (Amstrup 1995) reveal no significant changes in age at first reproduction, numbers of cubs produced per female, or litter sizes for cubs-of-the-year (COYs) or 2-year-olds. However the sizes of yearling litters were greater in the period from 1967 - 1974. Small sample sizes in the first period and differences in sampling procedures between the two periods may mask any change in litter sizes for COYs and 2-year-olds. The age structure of the population was younger during the first period, when survival was greater for young and less for adults, compared to the second period. These later changes are consistent with populations approaching K. Scientific data indicates population growth and empirical observations by Native hunters of increasing numbers of bears observed on and near shore further supports this population trend. Consequently, this stock has been assigned a recovery rate  $F_R$  of 1.0.

### **CURRENT AND MAXIMUM NET PRODUCTIVITY RATES**

Default values for  $R_{MAX}$  for Alaska polar bear stocks were not established at the La Jolla PBR workshop (Wade and Angliss 1997). Taylor et. al. (1987) estimated the sustainable yield of the female component of the population at < 1.6% per annum. The following information is used to understand the  $R_{MAX}$  determination. From 1981-92, vital rates of polar bears in the Southern Beaufort Sea were as follows: average age of sexual maturity (females) was 6 years; average COY litter size was 1.67; average reproductive interval was 3.68 years; and average annual natural mortality (nM), which varies by age class, ranged from 1-3% for adults (Amstrup, 1995).

Currently, the Southern Beaufort Sea population may be approaching K (Amstrup 1995). A Leslie type matrix of recapture data, which incorporates the best reproductive rates, and the best survival rates determined by the Kaplan Meir method, projected an annual intrinsic growth rate (including natural mortality but not human-caused mortality) of 6.03% for the Southern Beaufort Sea stock (Amstrup 1995). Since this calculation did not include human-caused mortalities it represented the "natural" survival rate. Survival rates for cubs and yearlings were also calculated with the assistance of radio telemetry. This mimics a situation in nature where environmental resistance is low and survival high. This rate of growth (6.03%) assumes human effects are absent. Further, the calculation assumes a 50M:50F population sex ratio.

## POTENTIAL BIOLOGICAL REMOVAL (PBR)

In the following calculation:  $(N_{\text{MIN}})(\frac{1}{2} R_{\text{MAX}})(F_R) = \text{PBR}$  (Wade and Angliss 1997) the minimum population estimate,  $N_{\text{MIN}}$  was 1,611; the maximum rate of increase  $R_{\text{MAX}}$  was 6.03 percent; and the recovery factor  $F_R$  was 1.0 since the population is believed to be within OSP. Assuming an equal sex ratio in the harvest, the PBR level for the Southern Beaufort Sea stock is 49 bears per year. In the Southern Beaufort Sea, however, the sex ratio of the harvest is approximately 2M:1F and thus the PBR level was adjusted to 73 bears per year with no more than 24 females harvested. The sex ratio of males to females in the population is assumed to be approximately 50/50. This figure is conservative and incorporates the best information available.

## ANNUAL HUMAN CAUSED MORTALITY

### Fisheries Information

Polar bear stocks in Alaska have no direct interaction with commercial fisheries activities.

### Alaskan Sport and Native Subsistence Harvest

Historically, polar bears have been killed for subsistence, handicrafts, and recreation. Based upon records of skins shipped from Alaska, the estimated annual harvest for 1925-53 averaged 120 bears and was primarily by Native hunters. Recreational hunting using aircraft was common from 1951-72, increasing annual harvest to 150 during 1951-60 and to 260 during 1960-72 (Amstrup *et al.* 1986; Schliebe *et al.* 1995). Aerial hunting has been prohibited since 1972. This reduced the mean annual harvest to 111 during 1980-96 (SD=56; range 41-297) (Schliebe *et al.* 1995) (Figure 2). The Southern Beaufort Sea polar bear harvest accounted for 32% of the total Alaska kill (annual mean=36 bears). The sex ratio of the harvest from 1980-96 was 69M:31F.

A management agreement between Canadian Inuit and Alaskan Inupiat of the North Slope has been in place since 1988 (Nageak *et al.* 1990). Since initiation of this local user agreement, the combined Alaska/Canada mean harvest from this stock has been 58.8 bears per year which is less than of an annual allocation guideline of 80 and PBR level of 73. The harvest in Canada is regulated by a quota system. The harvest in Alaska is regulated by voluntary actions of local hunters. In 1997 a Cooperative Agreement was developed between the U.S. Fish and Wildlife Service and the Alaska Nanuq Commission to implement Section 119 of the Marine Mammal Protection Act Amendments of 1994. This Agreement facilitates local participation in activities related to the conservation and management of polar bears.

The 1991-1996 mean harvest for the Southern Beaufort Sea in Alaska was 32.4 and the sex ratio is 71M:29F. Eleven recorded subsistence kills were taken for defense of life or property from 1991-1996 and are incorporated as subsistence takes. Approximately 7% of the documented harvest is comprised of bears which are not tagged in the Marking and Tagging Reporting Program (MTRP) established in 1988. Sex remains unreported for approximately 14% of the harvest, which includes 7% from both the documented and undocumented harvest, respectively.

### Other Removals

Orphaned cubs are occasionally removed from the wild and placed into zoos: One cub was placed into public display facilities during the past five years. Authorized activities ("incidental take" regulations), associated with the exploration, development, production, and transportation of oil and gas, may potentially impact polar bears and their habitat. In recent time three lethal takes related to industrial activities and one at a remote radar defense site on the north slope have been documented.

## STATUS OF STOCK

The Southern Beaufort Sea Stock has not been determined to be "depleted" under the MMPA or listed as "threatened" or "endangered" under terms of the Endangered Species Act. This stock is therefore within optimum

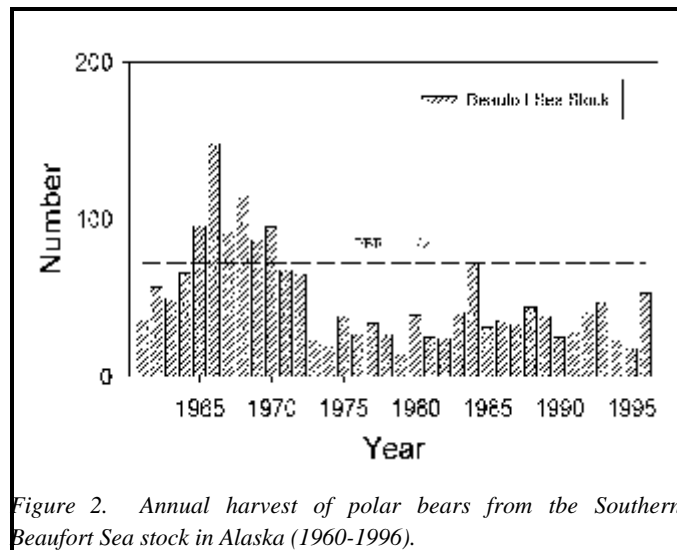


Figure 2. Annual harvest of polar bears from the Southern Beaufort Sea stock in Alaska (1960-1996).

sustainable population levels. The conservatively calculated PBR level is greater than the average human harvest. The stock does not experience any incidental loss to commercial fishing. Based on information prior to 1992 this stock appears to be increasing at an annual growth rate of 2.2% to 2.4% (Amstrup 1995). From 1991-1996 the Southern Beaufort Sea Stock has sustained a 1.9% harvest which is less than the maximum sustainable harvest. The Southern Beaufort Sea stock appears to be increasing slightly or stabilizing near K. The Southern Beaufort Sea stock of polar bears in Alaska is designated a "non-strategic stock."

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